

# A Survey on Smart Self Segregating Bin

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**Abstract:** Due to the rapid increase in the population especially in urban areas there has been a dynamic increase in the amount of waste and despicable dumping of waste has become a matter of concern because of the threat it causes to the environment. There comes the pivotal role of an automated waste segregate which avoid this plight and also reduces the difficulty of recycling. The importance and the economic value of waste is realized only when it is segregated. Currently there is no such system for segregation of metal, dry, plastic and wet wastes. Now presenting an innovative way which revolutionize the trash management system.

**Keywords:** Self Segregating Bin

## 1. Introduction

The rising population of India poses serious threats with regard to the availability of living space, utilization of natural resources, education & employment. But another serious peril that follows is the escalating amount of waste generated each minute by an individual. Present scenario in the public places where proper disposal is not being done because of which we come across overflow dustbins. Even the private areas which are clean enough failed to utilize the resources efficiently. Using Embedded technology to continuous monitoring the dustbin in order to check whether dustbin is full or not. The ultrasonic sensor will show the level of garbage filled in dustbin, whereas the proximity sensors will detect the obstacle present in front of dustbin to avoid collision. LCD interfacing has been done to show the current situation of dustbin. Wireless sensors to segregate the waste and senses the amount of waste in the containers if it reached the maximum container capacity, sends instant messages to the trash management department and it deploy waste where the trucks collect the garbage. By implementing this product at different location, instead of driving blindly on the static routes, we can optimize the collection schedule. We are proposing an IoT based solid waste management system which enables garbage bin monitoring, dynamic scheduling and routing of garbage collector trucks in a smart city. In the proposed system, garbage bins equipped with low cost embedded device are located at various places in entire city. Real time status of garbage level along with garbage bin location is sent to cloud. We have designed a cloud-based system for organizing solid waste management process and mobile application for waste collection drivers and Municipal

Corporation to monitor and control solid waste collection as a service. Mobile application facilitates the waste collection drivers to go to the garbage bins using dynamic and shortest route.

*Automated Waste Segregator, Amrutha Chandramohan, Joyal Mendonca, Nikhil Ravi Shankar, Nikhil U Baheti, Nitin Kumar Krishnan, Suma M S-[2014]*

This paper proposes an Automated Waste Segregator (AWS) which is cheap, easy to use solution for a segregation system for household use, so that it can be sent directly for processing. It is designed to sort the refuse into metallic waste, wet waste and dry waste. The AWS employs parallel resonant impedance sensing mechanism to identify metallic items, and capacitive sensors to distinguish between wet and dry waste. Experimental results show that the segregation of waste into metallic, wet and dry waste has been successfully implemented using the AWS. The proposed solution is as follows: Waste is pushed through a flap into the proposed system. An IR proximity sensor in the proposed system detects this and starts the entire system. The waste then falls on the metal detection system. This system is used to detect metallic waste. After this, the object falls into the capacitive sensing module. This module distinguishes between wet and dry waste. After the identification of the waste, a circular base which holds containers for dry, wet and metallic waste is rotated. The collapsible flap is lowered once the container corresponding to the type of the garbage is positioned under it. The waste falls into the container and the flap is raised. The waste in the containers can now be collected separately and sent for further processing.

*Automation of Plastic, Metal and Glass Waste Materials Segregation using arduino in Scrap Industry, Mohammed Rafeeq, Ateequrrahman, Sanjar Alam, Mikdad -[2016]*

This paper proposes an Automation of waste material Segregation in scrap industry. This method is easy and simple solution of segregation of three types of wastes glass, metal and plastic. It is designed to sort the trash into metallic waste, plastic waste and glass waste ready to be processed separately for the next process of operation. The Method uses inductive sensors metallic items, and capacitive sensors to distinguish between and dry waste. Experimental results show that the segregation of waste into metallic, plastic and glass waste has been successfully implemented using the Automation of material

segregation (AMS) method. The three materials found mostly in solid waste are Metal, Glass and Plastic [16]. These are the materials that can be recycled and the first step towards recycling is segregation. There are numerous benefits of recycling the waste materials. The proposed solution says that the Waste is pushed onto conveyer belt, the presence of waste is first identified by use of Infra-red sensor at start end of the conveyor belt, the waste moves further for detection with inductive sensor to detect it is metal or non-metal. If it is detected metal, conveyor motor rotates to in a direction to collect the metallic waste, for non-metal it moves further with capacitive detection of plastic or glass. With detection of plastic it rotates in other direction or moved by pivot to collect in other bin.

Automatic Waste Segregator, Sharanya. A, U. Harika, N. Sriya, Sreeja Kochuvila-[2017]

This paper aims to sort the waste into three major classes, namely metallic, wet and dry and further separating dry into paper and plastic. The most important feature of this work is that, it is not only cost efficient but also compact with a simpler design thereby making the waste management system more persuasive. In this paper, we are using Arduino UNO which makes the working of the system to be smooth and convenient making the design to be less complicated. Each of these wastes are detected by the respective sensors and discarded into the bins assigned to them wherein these wastes can be taken for recycling or reusing directly. The proposed solution says that the waste is kept on the specified position that is a slot on a rotating disc. An IR proximity sensor detects the waste and starts the entire system. Waste then keeps rotating on the disc and comes under the range of the first sensor which is the Moisture sensor for wet waste detection. If the waste is not detected as wet waste it goes to the next sensor that is Inductive Proximity sensor for the metal detection. This sensor is used to detect any metal waste in its vicinity. After the detection the trash comes under the succeeding sensor if not detected as metal. This module is a Laser LDR circuit that detects dry waste (plastic and paper). Once the waste is detected by any of the sensors the slot on which the waste is kept bends and falls into its respective bin with the help of Servo Motor. These bins are placed exactly below each sensor so that the trash can fall immediately after

detection. These bins are kept between the rotating disc and the stationary disc, which are at a certain distance. The IR proximity sensor sends an interrupt to the microcontroller Arduino UNO when the trash is detected. A LASER light is kept continuously ON as soon as the trash is detected. This light is placed exactly opposite to the LDR module. The trash is then moved to the moisture sensor. If the trash is detected as wet waste it falls into its bin else, it is moved to the next sensor in the queue. The next sensor is the inductive proximity sensor for metal detection. If the trash is considered to be metal it falls into the bin assigned for it else, it is moved to the next sensor. The next sensor is the LDR LASER module for plastic and paper

detection. If the LASER kept opposite to it passes through the trash it is detected as plastic else as paper. A DC geared motor is used to rotate the disc which is the upper disc. The slot has a servo motor to bend so that the trash falls into the respective bins.

Smart Bin-Automatic waste segregation and collection, Manisha Jayson, Sanket Hiremath, Lakshmi H R-[2018]

In this paper, they present SmartBin, a bin that is able to segregate waste at source with no human intervention and can automatically alert the waste collection centre when the bin is full. SmartBin will help solve the waste segregation problem and help build a greener society, with no compromise on health and hygiene. This SmartBin works on a simple yet efficient methodology. It may be customised for domestic or public use. The domestic variant will be smaller in size. The external surface may be made of durable plastic. The electronics and sub-bins for the different types of waste are made into two separate layers. The sub-bins are removable for cleaning purposes. The design uses a dual motor and tray mechanism. The waste is disposed off into a common waste tray, the only part visible to the user. It is detected by the IR sensor. This activates the moisture sensor which is fitted on the tray. There is a pre-set threshold value for classification as dry or wet waste. If the moisture sensor reading is above that value, it is classified as wet waste else it is classified as dry waste. The pre-set value may be suitably chosen to provide accurate segregation.

Automatic Waste Segregation, Nimisha S Gupta, Deepthi V, Mayakunnath, Rejeth Pal S, Badsha T S, Nikhil Binoy C-[2018].

This project proposes a spot automatic waste segregation unit that effectively gives a solution to this problem. In order to segregate the metallic waste a parallel resonance impedance system is used, and for the separation of wet and dry waste capacitive sensors are used. The benefits of this work are, the waste has a higher potential for recovery and the occupational hazards of waste separating workers is also reduced. The proposed system is a mobile unit whose motion is controlled by the user using the GUI and wireless interface is provided by a Zigbee transceiver pair. ATmega328P microcontroller is used, when the waste is dropped onto the conveyor belt by means of a metal plate controlled by servo motors. Metallic wastes are separated by the electromagnet attached to the servo motor controlled arm and the dry waste is blown off using a DC air blower directed by a flap. Ultrasonic sensor HC-SR-04 is used for power conservation when the conveyor is empty. This method involves the usage of three sensors namely IR sensor, moisture sensor and gas sensor which are attached to bins kept in public places. The IR sensor detects the waste and sends information to PIC16F877A microcontroller. Similarly, moisture sensor senses moisture in the bin when the wet waste is deposited and the gas sensor senses some unpleasant or toxic smell from the bin and sends information to the controller. The information is accepted using radio frequency (RF) receiver and the data is decoded by the decoder, and in the transmission side

controller receives the information and transmits the data using the encoder and an RF transceiver, the data is displayed on LCD. The 8051 microcontroller is used; the model consists of a stationary unit the waste is collected into a funnel shaped collector. Sensors are placed on this funnel. This paper proposes an advanced trash collection system with smart bins having sensors and that alerts the authorized collector by sending messages for efficient trash collection in cities, IOT is acting as a back born technology for the efficient management of waste. The system will receive the input through the dust collecting people through switches and sends back a signal to the microcontroller unit using RF technology and makes the H-bridge to rotate conveyor belt. When the belt starts rotating clockwise the dust bin's lid is automatically closed, simultaneously the waste is dumped into the underground garbage container. A waste segregation system using a programmable logic controller is designed to separate the metal particles from the municipal waste. It contains a rotating conveyor belt, which starts rotating when the metal particle is detected. A robotic arm functions when metal is recognized and conveyor belt stops. The control signal is given to the robotic arm by the controller, to which the electromagnet is attached and the metallic wastes drop into a separate bin. This paper shows how the Internet of Things integration with data access networks, Geographic Information Systems, combinatorial optimization and electronic engineering systems can contribute to improve the city's management system. Here presents a waste collection method based on providing intelligence to trash cans, by using an IoT prototype embedded with sensors. The waste

management as a set of services on top of an IoT infrastructure in a smart city. These services cover the waste collection planning and implementation, transport of waste to specific locations and recycling and preparation for reuse with the help of RFID, sensors and actuators. This work presented here gives a novel approach in handling and disposing of the daily solid wastes in an efficient method. The system consists of four main systems, namely smart trash system, local base station, smart vehicle system and smart monitoring and controlling hut. The proposed system would be able to automate the solid waste monitoring and collection process. It employs both collection and segregation of waste where collection part consists of specially designed baskets placed at the roadside in a fixed gap having air sensors, when your sensor senses basket fills and put down the waste to the sub conveyor. The segregation part contains sensors to separate into wet, dry and metallic.

Electronically assisted automatic waste segregation, Nandhini. S, Mrinal Sharma. S, Naveen Balachandran, K. Suryanarayana, D. S. Harish Ram [2019].

This paper proposes an Electronically assisted automatic waste segregation. This method is used for reducing pollution. Domestic waste creates pollution when it is being dumped in open space and keeps rotting, spreading odor thereby causing air and land pollution. If the garbage is dumped near water

bodies it causes water pollution too. Waste is the main cause of environmental pollution in both developed and developing countries. According to a report published in nature journal, by the end of year 2100, the garbage collected will be at the rate of 11 million tonnes per day globally, which is more than 3 times today's rate. This steady increase in the rate is estimated according to the present population growth rate. The environment impact due to improper treatment and disposal of waste can be devastating. Many type of waste if treated and used properly can not only reduce pollution but also serve as main source of energy. In urban areas, the municipalities collect domestic waste and transport to a particular place from where waste need to get categorized as which biowaste, like vegetables and fruits peel waste or whether to be reused or non-bio-degradable waste which need to be recycled, like plastic waste. At the municipality waste management centre, till date the only way to segregate waste has been manually performed using human labor. A robotic arm with 4 degrees of freedom is capable of picking waste from predefined locations within its workspace using an ultrasonic sensor attached to the gripper. This waste is then placed on a segregator platform where a web-cam captures the image. The image is then assessed using a convolutional neural network (CNN) classifier that uses Lenet-5 model which classifies the waste as bio-degradable or non-bio-degradable.

Design and Development of an Automatic Clustered, Assorted Trash Segregation System, Narendran Siva Kumar, Aditya Raj Kunwar, Sandeep Kumar Patel, Santosh Kumar, Pushpa Mala. S [2016].

This paper proposes an Automatic Clustered, Assorted Trash Segregation System Door-to-door collection of waste is an alternate method of segregation, but it is not widely used in India except in the metros where a few private organizations are carrying out such work. It is now becoming more and more essential to seek out methods by which the garbage load on the land can be reduced. At present, segregation of waste at source is most likely to be the best method. Several non-governmental organizations are working in the field of waste management like Clean Ahmedabad Abhiyan, Waste-Wise, Mumbai Environmental Action Group, Vatavaran and Srishti. They all successfully create awareness among the citizens regarding their rights and responsibilities towards management of solid waste and the cleanliness of their city. These organizations promote education and awareness in schools and they also encourage involvement of communities in the management of solid waste. It has been observed that the number of women and children entering into the business of rag picking is increasing rapidly. This is a matter of concern as the rag picker puts himself at risk because he is prone to diseases from the waste that he rummages through. The flaps of the funnel are controlled by infrared sensors. The waste is moved along a conveyor belt driven by DC motors. An ultrasonic sensor detects the arrival of waste along the belt and activates an air blower to blow off dry waste into a separate container. The

untouched wet waste simply falls off the end of the conveyor belt into a separate container. The model successfully separated kitchen wastes, metallic wastes among others. This model had the size requirement of the waste to be smaller than the 20cmx20cm sized funnel. It was a time consuming process and the metallic waste had to be manually scraped off from the magnetic container. It actively monitors the waste collection process and provides useful information such as waste collection status, tracking of waste collection trucks and trash bins etc. The residents can drop in their complaints about uncollected waste and also the unauthorized disposal of waste. One of the main features of the system is the ability to calculate the shortest path so that the collection vehicles need to travel lesser distance to collect waste. This system is developed on android platform to support diverse classes of mobile devices.

Eco-Friendly IOT Based Waste Segregation and Management, Santhosh Kumar B R, Rohit K, Varalakshmi N, Manjunath, Soundarya S Lokeshwari, Sahana D N [2017].

The main objective of this paper is segregation of wastes i.e. biodegradable, metal and plastic. The waste dropped into the dustbin is segregated at the panel with the help of sensors and the corresponding valves of the segment are opened and the waste is dumped into their respective segment. The biodegradable segment is equipped with sensors to detect microbes and their activities are controlled by chemical treatment when the indicator specifies alarming levels. Methane gas is produced in the biodegradable segment and the same is sensed by the gas sensor and odour controller is used to spray the liquid when the methane gas reaches a particular value. Wi-Fi module is connected to the data service, to continuously monitor the threshold level of the waste in the dustbin. Once the wastes reach the threshold level, message is sent to the user, as that particular segment is filled and it has to be disposed. STM32 controller is used to carry out all the activities in the dustbin. Similarly, the metal as well as plastic wastes are detected and segregated into their respective segments using inductive and capacitive sensors. The segment which collects the metal objects is coated with an acrylic coating to prevent the reactivity of the metals. Each segment is equipped with a level detecting sensor to indicate the level of waste collected in each segment and when a threshold level is reached in each segment message is displayed on the dustbin as a particular segment is filled and the same message is sent to the authorities by the means of Wi-Fi module.

Each segment of the dustbin can be detached separately in order to dispose the trash in an accomplished manner, so that the segregated waste can be recycled and utilized. It synchronizes the activities of hardware and software modules in sequential manner. Sensors namely moisture, capacitive, inductive, gas level detecting and microbe sensors, which acts as input and output controls to the system. When the wastes are dropped into the bin corresponding sensors operate and the wastes are collected in their respective segments. Level detecting sensors monitor the level of wastes collected in each

segment and continuously compare the values specified in the cloud and when it reaches a particular level, user receives an message as that particular segment is filled. Bacteria sensor tracks the microbial activities. Odour controller is used to minimize the unpleasant odour by spraying chemicals.

Smart Bin (Waste Segregation and Optimisation) Wesley Pereira, Saurabh Parulekar, Sopan Phaltankar, Vijaya Kamble [2019].

This paper proposes the waste segregation and optimisation process. With the advent of the plastic ban and people having so many plastics in their households, SMART BIN can help dispose of the waste properly and efficiently without any problems. Also, the wet waste can be used as compost and some of the dry waste can be recycled. SMART BIN identifies the type of waste and segregates it using the techniques mentioned. This segregation by a machine thus brings an end to the segregation done by humans, which is again a filthy job as no human should touch such toxic and dirty waste thrown by us and also sometimes this segregation process isn't very precise. Another important issue we face is we do not actually account for what kind of garbage we throw. The smart bin gives us a weekly analysis through the app connected to the bin about the type of garbage thrown. Along with this, the smart bin will also provide solutions to what kind of garbage can be used as compost or which Garbage can be recycled or reused. This solves the important issue of not wasting resources. The smart bin is connected to the app and this app tells us what waste is exactly disposed of by comparing their capacitive values. The app is connected to the cloud where a network is created. Now based on this network we can optimize garbage paths. We can identify when each of the bin gets full and at what particular time and can have an optimized path set for the garbage disposal vehicles. This will save us a lot of money in terms of fuel and will also save a lot of time of the people involved in this process. The door of the smart bin opens automatically when a person comes to close proximity. For this, we are using an Ultra- sound sensor. The ultrasound sensor realizes when a person comes close enough and is about to throw the waste and the door opens. A servo motor is connected with the door, hence anything in the close proximity triggers the door to open. This makes the smart bin completely hands-free.

Smart Garbage Segregation & Management System Using Internet of Things (IoT) & Machine Learning (ML), Shamin. N, P. Mohamed Fathima, Raghavendran. R, Kamalash Prakash [2019].

This paper proposes IoT related propelled trash segregation and the management framework which verifies the garbage in dustbins using sensors and once it is recognized the waste materials in it will be segregated with the assistance of sensors and quickly this framework adjusted to cloud database through IoT. Internet of things (IoT) is the expansion of web availability into physical gadgets and everyday items are inserted with gadgets, net availability and diverse sorts of equipment, (for example, sensors). These contraptions will convey and connect

with others over the web and that they can be remotely observed and controlled. It is a registering thought that depicts the idea of regular physical items being associated with the web and being able to spot themselves to elective gadgets. Usage of a system of sensors and different gadgets through the methods for electronic and other programming so as to get information about that physical gadget. The inexact populace of India is 135 crores. Populace of India is ascending at disturbing rate. At an identical time, India is yet again heading into the most exceedingly terrible time for contamination, a season where the nation's famously awful quality transforms into even a ton of toxicant. Contaminations are key part/pieces of dirtiness that are ordinarily squander materials of various structures. With modernization & movement in our lives contamination has achieved its summit; offering move to a general temperature change and human ailment. Contamination can happen in many sources such as light, water, heat/warm, air and soil. The point and no point sources are the two generous occasion of violation. Point sources can be anything and is remarkably tough to screen, perceive and control, though the non-point sources are just tough to control plastic destruction, total in the earth of designed plastic things to the point where they make issues for characteristic life and their surroundings similarly with respect to human peoples. This paper proposes IoT based totally clever waste segregation and administration machine which assessments the wastes in the dustbins through the usage of Sensor systems and as soon as it detected the waste substances in it will be segregated with the assist of sensors and right away this machine altered to cloud via IoT. We utilize Microcontroller as a mediator between the sensor devices and IoT system. Ultra-sonic sensor is used to detect the presence of the waste material. The moisture sensor's work is to detect the moisture in the waste, and if there is moisture presence then the

waste cannot be put in the dustbin. Metal sensor is used to separate the metal items and is separated to a section. Image processing is used to identify the plastics and degradable items and is separated to another separate sections. The dustbin data are uploaded to the cloud database using IoT in real time.

## 2. Conclusion

This paper presents the survey on the various papers based on the smart Bin to segregate trash. The main objective of the project is to segregate waste at source level to wet, dry and metallic such that waste is not wasted but their value is understood and can be converted to source of energy, in a cost-effective way. The benefits of doing so are that the higher quality of materials is retained for the recycle purpose which means that the more value could be recover from the waste and also the hazardous for the waste worker is reduced. Segregated waste is directly sent to recycling plants.

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